with which it seems most closely allied. Both of these species may show the general arrangement of arm spines and dorsal arm plates, but with less extreme and less regular development. In these species the fan-shaped or triangular dorsal arm plates are sheared to a lesser degree at the lateral angles, and consequently the uppermost arm spines of each segment are less conspicuously developed. However, three and four spines on opposite sides of the same segment occur in some specimens of these species. Often both species possess the flattened spatulate lower spine. In general, as shown by comparison of specimens from Canton Island, *anaglyptica* approaches *scolopendrina* more closely than *erinaceus* in these respects. However, considerable individual variation very likely occurs.

In coloration, *anaglyptica* is somewhat intermediate. The uniform coloration suggests *erinaceus*, but it is not black. On the other hand, the lighter spotted and mottled oral surface and striped lateral intersegmental areas are more typical of *scolopendrina*. Further noteworthy differences may be seen in the disk granules which are more widely and evenly spaced in *anaglyptica* than in either *erinaceus* or *scolopendrina*. Also the shape of the second innermost oral papilla is distinctive for *anaglyptica*. In this species it is round and scalelike, whereas in *erinaceus* and *scolopendrina* it is rectangular.

ICHTHYOLOGY.—*A description of a new gobiid fish from Venezuela, with notes on the genus* Garmannia.[1]

ISAAC GINSBURG, U. S. Fish and Wildlife Service.
(Communicated by LEONARD P. SCHULTZ.)

The specimens forming the basis of this paper were collected by Dr. Leonard P. Schultz, curator of fishes in the U. S. National Museum, on his recent expedition to Venezuela and turned over to me for study. These comprise one specimen of *Evorthodus lyricus*, 45 specimens of *Bathygobius soporator*, and 158 specimens, in six samples, belonging to populations of *Garmannia*, most nearly related to *G. spes*. The latter specimens illustrate a common course of speciation in fishes.

Garmannia spes was described by me (JOURN. WASHINGTON ACAD. SCI. **29**: 62. 1939) from three small specimens, not in very good condition, which were brought back from the Canal Zone by Dr. Samuel F. Hildebrand in 1937. The samples collected by Dr. Schultz in Venezuela are evidently closely related to *spes*. Although these samples were taken in comparatively close proximity, within a range of about 50 miles, yet they show average morphological differences, but of varying degrees. The populations represented by the samples examined are divisible into two primary groups, which may be treated as representing two species. The other differences, within the primary groups, are of lesser degree, racial, or subspecific at the most. One of the species from Venezuela is evidently the same as the Panamanian *spes*. The other species is here described as follows and named for Dr. Leonard P. Schultz:

[1] Received July 25, 1944.

Garmannia schultzi, n. sp.

Diagnosis.—Anterior part of body naked, scaled posteriorly. Transverse row of scales on caudal base absent. A lengthwise row of 3–6 nonimbricate, spaced scales behind pectoral base. Head depressed to subterete. First dorsal spine not prolonged. Dorsal rays usually 11, often 12. Anal rays usually 10, often 9, infrequently 8. Pectoral rays modally 17, often 18, sometimes 16, infrequently 19. Usually diffusely and irregularly cross-banded, alternating lighter and darker, irregular areas; often nearly uniformly colored, especially in the larger males; caudal uniformly pigmented or faintly cross-banded, band at base usually rather more prominent; ventral aspect usually more or less pigmented, moderately or not much lighter than side. Extent of squamation differing markedly with sex, less extensive in male, as follows (also differs with population, see below). Male: scales extending forward to a point under base of fifth to tenth dorsal ray; transverse rows of scales 7–12, longitudinal rows 3–5. End of maxillary reaching approximately to under posterior margin of eye. Female: scales extending forward to under base of third to eighth ray; transverse rows 9–14; longitudinal rows 3–7. Maxillary ending under posterior margin of pupil.

Holotype.—U.S.N.M. no. 121546, male, 22 mm, Lago de Maracaibo, 7 km south of Maracaibo City; gravel and sand; March 6, 1942; Leonard P. Schultz.

Paratypes.—U.S.N.M. no. 121547; 19 males, 12–21 mm, 14 females, 12–17 mm; obtained with the holotype.

Other specimens examined.—Lago Maracaibo at Yacht Club, just north of Maracaibo City, hard bottom, rubble to gravel; 4 males, 17–28 mm, 2 females, 21–23 mm, 1 specimen, 13 mm, sex not determinable by external examination; these 7 specimens in two samples, collected March 5 and May 16, U.S.N.M. nos. 121549 and 121550, respectively. Salina Rica, coast of El Tablazo (the latter a bay between Lake Maracaibo and Gulf of Venezuela, partly continuous with both), 5 km north of Maracaibo City; bottom thick vegetation in mud; 5 males, 21–28 mm, 2 females, 24 mm, all in one sample collected February 20, U.S.N.M. no. 121548. Ciénaga del Guanavana, on coast of Gulf of Venezuela, 12 km north of Sinamaica; swampy bottom; March 11, one male, 29 mm, with 16 pectoral rays, 2 specimens, partly dried, with 17 rays, U.S.N.M. no. 121552. All specimens collected by Dr. L. P. Schultz in 1942, in brackish water. (Dr. Schultz kindly furnished the ecological notes. A discussion of the itinerary during which the samples were taken is given by Dr. Schultz in a paper entitled "The Catfishes of Venezuela, with Descriptions of Thirty-eight New Forms," Proc. U. S. Nat. Mus. **94**: 173–338. 1944.)

Squamation.—The extent of squamation, both vertically and horizontally, varies widely with the individual, and the norm differs with the population. There are several ways in which the variability of this character may be expressed: (1) by counting the number of transverse rows; (2) stating the position of the anteriormost scales with reference to the second dorsal base; (3) counting the number of longitudinal rows; (4) noting whether the dorsal aspect of the caudal peduncle is scaled over or naked. The first two ways express the horizontal extent of squamation; the last two the vertical extent. All the four ways have been determined on the specimens examined.

In counting the transverse rows, the first row usually consists of one or two scales; this row was included in the count. The number of transverse rows constitutes a fair numerical expression of the horizontal extent of squamation. It is more difficult to express adequately the variability in the vertical extent, as the number of longitudinal rows is much fewer and, what is more important, there is much greater variability in the number of individual scales in the different rows. The number of scales in the two outer longitudinal rows, one above and below, is very variable, often consisting of only one scale, and such a row was also included in the count. Therefore, it is evident that the number of longitudinal rows represents only a very roughly approximate expression of the vertical extent of squamation.

The spaced scales in the row behind the pectoral base are often partly or wholly missing in preserved specimens, being more or less deciduous. However, when missing, the edge of the scale pocket may be readily raised with a dissecting needle, and the number of scales originally present in any given specimen may be thus ascertained. The distribution given in Tables 2 and 3 includes specimens so determined.

Sex differences.—Males and females differ in the extent of squamation, and it is necessary to separate data for scale characters by sex, as is done in Tables 2 and 3. This is a sex difference that is out of the ordinary in fishes. Table 1 also shows some average sex differences in fin-ray counts; but these differences are slight and their reality may be doubted. They may be due to vicissitudes of sampling.

Comparison.—*Garmannia schultzi* is very closely related to *G. spes*. The most divergent character separating them is the pectoral count. They overlap even in this character (Table 1) but the degree of divergence is high. Their index of divergence, using the measure proposed by me (Zoologica **13**: 253–279. 1938), is 92, which is of the magnitude of full species. The population represented by the holotype also differs to some extent from *spes* in the extent of squamation, but the Salina Rica population of *schultzi* nearly agrees with *spes* in this respect.

As there is no other widely divergent character to correlate with the pectoral count, single specimens usually can not be distinguished with certainty. If a specimen has 15 pectoral rays it almost certainly belongs to *spes*, and if it has 18 or 19 rays, it evidently belongs to *schultzi;* but

single specimens having 16 or 17 rays (these are the counts in which the majority of the specimens fall, 16 and 17 being the modal counts of *spes* and *schultzi*, respectively) can not be identified with assurance, and it is necessary to have a sample of 5 or 10 specimens for a satisfactory identification. For instance, in a sample of three specimens from the Ciénaga del Guanavana (see above), one had 16 and the other two 17 pectoral rays, and it is consequently most likely that this small sample belongs to a population of *schultzi*.

Populations.—Though it is true that they are relatively near one another geographically, the populations of *schultzi* represented by the samples examined apparently differ to a considerable extent morphologically. The differences in the extent of squamation, as expressed by the number of transverse and longitudinal rows and the number of spaced scales in the row behind the pectoral base, are shown in Tables 2 and 3. The small samples examined suggest that the population living 7 km below Maracaibo City diverges from the Salina Rica population, which is only 5 km above Maracaibo City, to a degree that may prove to be of subspecific magnitude when adequately larger samples are examined. Another difference between these two populations, which is also a result of the difference in the extent of squamation, is as follows: In the Salina Rica population the dorsal aspect of the caudal peduncle is partly or almost wholly scaled over, while in the population about 12 km farther south it is naked. The Salina Rica population also may possibly prove to average slightly fewer dorsal and anal rays (see Table 1), but such differences, if real, are evidently of very low degree.

The southernmost population of *schultzi* examined averages the least extent of squamation, consisting in some extreme variants, usually males, of virtually nothing more than a moderate elongate patch on the caudal peduncle. The population at the Yacht Club is, in general, morphologically about intermediate between the two populations compared above; but only one specimen out of seven has the dorsal aspect of the caudal peduncle scaled, being in this respect nearest the southernmost population.

The sample taken in a bayou near Sinamaica, which is referred to below to *spes*, is possibly just another closely related local population which, however, has diverged from the others to such a degree that it may be treated as a distinct species. This Venezuelan population is morphologically near enough to the Canal Zone population, originally described as *spes*, for the two to be treated taxonomically as belonging to one species. If this conjecture (that the Venezuelan sample of *spes* represents merely a highly divergent local population) is tenable, it follows that among these populations morphology is not always regularly correlated with geographic distribution. The population at the Yacht Club is geographically as well as morphologically intermediate between the populations north and south of it; but the population near Sinamaica, which is here referred to *spes*, is sandwiched in between populations that are sufficiently divergent from it to be properly placed in another species.

It should be added that the samples examined are not strictly comparable for size; the 34 specimens of *schultzi* from south of Maracaibo City are considerably smaller than most specimens in the other samples of the same species. However, the full adult squamation appears to be developed in specimens as small as 14 mm, and the differences outlined above are evidently population differences.

The ecological factors are not well enough known for one to discuss adequately, or speculate about, influence of environment on morphological diversification. The nature of the bottom does not seem to be decisive, as *schultzi* seems to inhabit both soft and hard bottoms (see above). All the populations referred to *schultzi* were taken in saline water, while the Venezuelan sample of *spes* was taken in fresh or nearly fresh water. However, the original sample of *spes* from the Canal Zone was taken in saline water also; consequently, salinity likewise does not seem to play a decisive role.

Garmannia spes Ginsburg

Garmannia spes Ginsburg, Journ. Washington Acad. Sci. 29: 62. 1939.

Sample collected in a caño [bayou] about ¾ km west of Sinamaica (the latter about 55 km north of Maracaibo City), Gulf of Venezuela; in thick vegetation on mud; nearly fresh water; L. P. Schultz; March 11, 1942; 52 males, 18–41 mm, 55 females, 15–27 mm, U.S.N.M. no. 121551.

As shown in Tables 1–3, the Venezuelan population represented by the above sample is close enough to the one from the Canal Zone for the two to be grouped in one species. As there are only three Canal Zone specimens available for comparison, the differences between the two populations can not be discussed at length. Very likely the Canal Zone population will prove to average a higher dorsal count, to what extent remains to be seen.

Morphological relationship of the species of Garmannia.—Seven species of *Garmannia*,

TABLE 1.—FREQUENCY DISTRIBUTIONS OF THE FIN-RAY COUNTS IN GARMANNIA SCHULTZI AND G. SPES

Population	Sex	Pectoral					Dorsal			Anal			
		15	16	17	18	19	10	11	12	8	9	10	11
schultzi:													
Below Maracaibo City....	♂	—	2	12	5	1	—	10	9	—	3	16	—
	♀	—	1	8	5	—	—	11	2	1	3	9	—
Yacht Club.....	♂	—	—	4	—	—	—	3	1	—	—	4	—
	♀	—	—	1	1	—	—	2	—	—	—	2	—
Salina Rica.....	♂	—	1	4	—	—	—	5	—	—	1	4	—
	♀	—	—	1	1	—	—	2	—	—	1	1	—
spes:													
Venezuela.....	♂	21	29	2	—	—	1	32	19	—	9	42	1
	♀	12	39	4	—	—	1	35	19	—	10	44	1
Panama.....	♀	—	3	—	—	—	—	1	2	—	—	3	—
schultzi:													
Total.....	♂	—	4	20	5	1	—	19	10	—	4	25	—
	♀	—	1	10	7	—	—	15	2	1	4	12	—
Grand total.....		—	5	33	12	1	—	35	12	1	8	38	—
spes:													
Grand total.....		33	71	6	—	—	2	68	40	—	19	89	2

TABLE 2.—FREQUENCY DISTRIBUTION OF SCALE COUNTS IN MALES OF GARMANNIA SCHULTZI AND G. SPES

Population	Tranverse rows						Longitudinal rows				Number of scales behind pectoral		
	7	8	9	10	11	12	3	4	5	6	3	4	5
schultzi:													
Below Maracaibo City....	1	2	9	6	—	—	8	10	1	—	9	10	1
Yacht Club.....	—	—	4	—	—	—	—	1	3	—	2	2	—
Salina Rica.....	—	—	1	1	1	2	—	—	—	5	—	4	1
spes:													
Venezuela.....	—	5	16	15	2	1	2	10	24	1	21	28	3

TABLE 3.—FREQUENCY DISTRIBUTIONS OF SCALE COUNTS IN FEMALES OF GERMANNIA SCHULTZI AND G. SPES

Population	Transverse rows								Longitudinal rows					Number of scales behind pectoral				
	9	10	11	12	13	14	15	16	3	4	5	6	7	2	3	4	5	6
schultzi:.....																		
Below Maracaibo City.....	3	2	1	5	1	—	—	—	3	4	2	3	—	—	2	9	3	—
Yacht Club.....	—	—	—	—	1	1	—	—	—	—	1	1	—	—	—	1	—	1
Salina Rica.....	—	—	—	—	—	2	—	—	—	—	—	1	1	—	—	1	1	—
spes:																		
Venezuela.....	—	—	2	4	13	15	4	1	—	—	23	20	1	—	6	25	18	6
Panama.....	—	—	—	1	1	—	1	—	—	—	1	1	—	1	1	1	—	—

namely, *hildebrandi*, *spilota*, *spes*, *homochroma*, *pallens*, *gemmata*, and *mediocricula*, have been described by me at different times during the past four years. Two other species, *Gobius chiquita* Jenkins and Evermann and *Gobiosoma macrodon* Beebe and Tee-Van, generally placed in other genera by authors, should also be included in *Garmannia*. The above species together with *paradoxa*, the genotype, and the one here described, *schultzi*, constitute a total of 11 species now known, which are comprised within the limits of *Garmannia*. Other species hitherto placed by authors in *Garmannia* apparently should be transferred to other genera. (*Gobiosoma digueti* Pellegrin, inadequately described, the type of which is presumably in the Paris Museum and has not been examined by me, possibly also belongs to *Garmannia*.) It is, therefore, timely to give a short resume of the genus.

The 11 species of *Garmannia* show differences of varying degrees, some of them diverging widely in their morphological characters as compared with others. In order to display prominently the divergences for taxonomic purposes the genus may be divided into a number of subgenera, as follows:

Subgenus **Tigrigobius** Fowler

Tigrigobius Fowler, Proc. Acad. Nat. Sci. Philadelphia **83**: 401. 1931.

Genotype: *Garmannia macrodon* (Beebe and Tee-Van) = *Gobiosoma macrodon* Beebe and Tee-Van (Zoologica **10**: 226. 1928).

Besides the genotype, *pallens* is also referrable to *Tigrigobius*. This subgenus differs from all others in the dentition of the upper jaw. The outer row of teeth ends about midway between the symphysis and the angle of the mouth and the last tooth in the row is caninoid, appreciably larger than the teeth anterior to it. The maxillary is rather long, attaining approximately to the posterior margin of the eye. The head is strongly compressed. The squamation covers about the posterior third of the body in *pallens* and is reduced to a small patch on the caudal peduncle in *macrodon*. The color pattern is sharply cross-banded in *macrodon*, more moderately so in *pallens*.

Gobicula, n. subg.

Genotype: *Garmannia gemmata* Ginsburg (Smithsonian Misc. Coll. **98** (14): 3. 1939).

This monotypic subgenus is nearest to *Tigrigobius*, nearly agreeing with it in the backward extension of the maxillary and the head shape. It differs in the dentition of the upper jaw, which, as in the other subgenera, except *Tigrigobius*, has the teeth in the outer row extending nearly to the angle of the mouth and the posterior teeth are somewhat smaller than the anterior ones. The squamation is confined to the caudal peduncle. The cross-banded color pattern is obsolescent.

Gobiolepis, n. subg.

Genotype: *Garmannia hildebrandi* Ginsburg (Journ. Washington Acad. Sci. **29**: 62. 1939).

Besides the genotype, *chiquita* and *spilota* are also referable to *Gobiolepis*. This subgenus differs, in general, from the others, except *Gobiculina*, in the greater extent of squamation, although the division is not sharp when all the species are considered. The squamation on the midline extends all the way forward nearly to the pectoral base. In *hildebrandi* the anterior squamation, in the area anterior to the second dorsal, is much reduced, consisting largely of a rather narrow band of scales on the midline; in *chiquita* nearly the entire body is scaled over; while in *spilota* the squamation is about intermediate between that of the preceding two species. The maxillary ends under the posterior margin of the pupil or middle of eye. The head is depressed or subterete. The color pattern is diffusely cross-banded or no cross-bands are evident.

Subgenus **Garmannia** Jordan and Evermann

Garmannia Jordan and Evermann, Proc. California Acad. Sci. (2) **5**: 497. 1895.

Genotype: *Garmannia paradoxa* (Günther) = *Gobius paradoxus* Günther (Proc. Zool. Soc. London, 1861: 372).

Besides the genotype, *mediocricula*, which was described from two specimens in rather indifferent condition, probably also belongs to the subgenus *Garmannia*. This subgenus differs from all others, except *Gobiohelpis*, in having the fourth transverse row of cutaneous papillae on the cheek interrupted instead of continuous. The head and maxillary are about as in *Gobiolepis*. The squamation closely approaches that of *Gobiolepis*, but it is not quite so extensive. The posterior half of the body is scaled over; the anterior half is either naked or a median

row of nonimbricate or overlapping scales is present, sometimes a second incomplete row.

Gobiohelpis, n. subg.

Genotype: *Garmannia spes* Ginsburg (JOURN. WASHINGTON ACAD. SCI. 29: 62. 1939).

This subgenus comprises *spes* and *schultzi*. It differs from all other subgenera in lacking a transverse row of scales on the caudal base. In other characters it nearly agrees with the subgenus *Garmannia*.

Gobiculina, n. subg.

Genotype: *Garmannia homochroma* Ginsburg (JOURN. WASHINGTON ACAD. SCI. 29: 62. 1939).

This monotypic subgenus differs from all others in having a small barbel below the anterior nostril, a very long maxillary which extends somewhat behind the eye, at least in the male, and a markedly depressed head. The extent of squamation is about as in *Gobiolepis*.

Remarks.—The above is a brief outline of some of the characters, which omits for the sake of brevity some other pertinent but less well marked characters. There are apt to be differences of opinion regarding the taxonomic status of the subgenera established, depending on the prevalent taxonomic practice in different groups of living things, or on the ideas of individual taxonomists. According to usage now common in American ornithology, for instance, these subgenera should perhaps be raised to full generic rank, for the degrees of morphologic divergence between them is approximately of the same magnitude as that between closely related groups of species of birds, which are often recognized by American ornithologists as full genera. Also, according to the standards used by some individual ichthyologists the above subgenera should be treated as full genera. However, the essential object of displaying prominently the marked morphologic divergence between the groups of species is attained equally well by segregating them into subgenera as into full genera. On the other hand, convenience is best served by the taxonomic treatment here proposed of considering them as subgenera. In the practice of taxonomy it is much more convenient to have fewer and larger genera.

GRANTS IN AID

The WASHINGTON ACADEMY OF SCIENCES has been allotted certain moneys from the Academy Grants Fund of the American Association for the Advancement of Science for the purpose of making grants in aid to young and promising scientists who have worthwhile research projects but lack the funds to continue work on them. The funds may be applied to the purchase of necessary equipment or supplies, but they are not to be used toward publication costs. The typing of manuscripts is considered as being related to publication and payment for such work is not regarded as justifiable assistance. The recipient of a grant is required to make progress reports on blank forms furnished by the American Association for the Advancement of Science.

The WASHINGTON ACADEMY OF SCIENCES now has $350 available and is prepared to receive applications for grants in aid up to the total of that sum. Grants may be made to one or more individuals, depending upon the amounts asked for and providing the total does not exceed $350. Application may be made by any member of the Academy or one of its affiliated societies. Letters describing the nature of the project and the amount of the desired grant should be addressed to the Secretary of the WASHINGTON ACADEMY OF SCIENCES, Dr. FERDINAND G. BRICKWEDDE, National Bureau of Standards, Washington 25, D. C., and should be in his hands not later than February 1, 1945.

Inasmuch as most of the members of the WASHINGTON ACADEMY OF SCIENCES are associated with some governmental agency or private research institution that not only provides them with the necessary laboratory space but also supplies the funds with which to carry on the work, it is suggested that as far as possible the proposed projects not be related to the research being carried on as a part of the applicant's regular duties.